LETTERS TO THE EDITOR.

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Mendelian Characters among Shorthorns.

I HAVE just come upon a phenomenon which, although it may be interesting to naturalists, may be alarming to breeders of Shorthorn cattle. It is that the roan Shorthorn is a hybrid, and must remain so for ever.

The data on which this statement is based are to be found in a paper on the inheritance of coat-colour in cattle, by Miss A. Barrington and Prof. Karl Pearson, published in *Biometrika* for March, 1906.

For the purposes of their paper these authors, having examined in the Shorthorn Herd-book the pedigrees of more than 2000 calves, noted the colours of these and their parents, and analysed and tabulated the figures found. They divided the sires and dams according to the colours under which they are registered, and then made an analysis of the colours of the calves produced. There are five different colours registered, viz. red, red and little white, red and white, roan, and white. A sire of any one of these colours may be bred with a dam of any one of them. Miss Barrington and Prof. Pearson made an analysis of the colours of the calves produced by bulls of all the five colours when bred with cows of every one of the same five colours. For instance, they found that by mating 514 roan bulls with 514 roan cows there had been produced eighty-six red calves, thirty-one red with little white calves, thirty-five red and white calves, 278 roan calves, and eighty-four white calves.

These cases at a first glance give rise to no Mendelian suggestion. No more does the full collection of cases. Miss Barrington and Prof. Pearson failed to find in them any Mendelian indications.

But if we consider the nature and history of the Shorthorn breed the Mendelian characters come out. The Shorthorn is a composite breed. A hundred and fifty years ago it consisted of at least three, and possibly four, different strains. The chief ancestry came from the Low Countries. They were red-and-white flecked cattle—*fleckvieh*. In Durham and Yorkshire they wedged themselves in between the original British black cattle in the north and the Anglo-Saxon red cattle in the south. They also possibly reached westwards to the Longhorns. The Anglo-Saxon red cattle were probably the purest. The northern black cattle and the western Longhorns were not pure. They were intermixed with white cattle—cattle which had been introduced originally by the Romans. It was impossible for the recently introduced flecked cattle not to become mixed with black blood in the north, with white blood in the north and west, and with red blood in the south. Breeders, however, did not like the black blood, and it was soon bred out. The white was retained, but, so far as I know, it is difficult to say how much Anglo-Saxon red blood was retained. It is on that ground any uncertainty arises. But, if red blood was retained, it was nearly related to the red and white blood introduced from the Continent.

If we look upon the Anglo-Saxon red cattle and the Low Country red-and-white cattle as being of one race, then, since the black blood was bred out, the Shorthorn is a combination of two races. If we look upon these red and red-and-white cattle as different races, then the Shorthorn is a combination of three.

I tried to find Mendelian characters among the cases collected by Miss Barrington and Prof. Pearson by assuming the Shorthorn to be a three-fold combination, but unsuccessfully. Then Prof. Arthur Thomson's account of the blue Andalusian fowl in his newly published "Heredity" suggested the idea that the red, red and little white, and red-and-white Shorthorns might be taken as one race. Are not these Shorthorns splashed reds just as one of the blue Andalusian parents is "splashed white"? The Shorthorn, then, becomes a composite breed with one parent white and the other splashed red. Assuming this to be so, then the Mendelian characters of the Shorthorn come out. There are one or two small discrepancies, but they can be explained. It is sometimes difficult to say whether a calf is red-and-white or roan. Thus all that are labelled red and white may not be really red and white, and all that are labelled roan may not be really roan. Among Shorthorn breeders white calves are not desirable. Cases of false registration and the substitution of another calf for a white—that is, giving a red or a roan calf a white calf's pedigree—have not been unknown. Thus some red or roan calves may not be the progeny of the parents attributed to them. For the same reason that white calves are undesirable, a good many white calves are not registered at all. Thus the real numbers of white calves born are greater than the numbers registered, and the number of matings recorded is less than it ought to be through matings that produced white calves being unrecorded. For the reason that white calves are not wanted, a white bull and a white cow are very seldom mated. Thus very few such matings are registered.

Assuming the Shorthorn to be a combination of two races, a red and white, then, according to the Mendelian formulæ as exemplified by the blue Andalusian fowl, we ought to get the following results:—

(1) Red crossed by red should give red calves.

(2) White crossed by white should give white calves.

(3) Red crossed by white should give roans.

(4) Roans inbred should give reds, whites, and roans in the proportion of 1, 1, 2.

(5) Roans crossed by reds should give roans and reds in equal proportions.

(6) Roans crossed by whites should give roans and whites in equal proportions.

This, giving heed to the expected exceptions as indicated above, is what we find, viz.:—

	Red	Roan	White
438 Reds crossed by reds give ...	413	25	0
3 Whites crossed by whites give	0	0	3
71 Reds crossed by white give...	3	68	0
514 Roans crossed by roans give ...	152	278	84
456 Roans crossed by reds give ...	226	230	0
23 Roans crossed by whites give...	0	14	9

For the breeder of Shorthorns this means that, if he wishes to avoid white calves, he is limited to three crosses, viz. red with red, red with roan, and red with white. He gets whites when whites are bred together, when whites are bred with roans, or when roans are bred together.

JAMES WILSON.

Royal College of Science, Dublin, March 19.

The Nature of γ and X-Rays.

IN a letter to NATURE of January 23 (p. 270) Prof. Bragg mentions the results of some experiments on γ rays from which he concludes that the ether pulse theory of γ rays is not tenable, but which support his theory that the γ rays consist of neutral pairs revolving in a plane containing their direction of translation. From the close resemblance of X-rays to γ rays he assumes that they also consist of neutral pairs. His reasoning seems to be that if the γ rays are ether pulses only, they should produce in any substance which they strike secondary kathode rays which come off equally in all directions, and if they do not the ether pulse theory cannot be correct.

Prof. Bragg's experiments show that the secondary kathode rays coming from the side of a substance on which the γ rays fall differ in the amount of ionisation they produce from those coming from the side from which the γ rays emerge. Also that the "emergence" kathode rays from a substance of low atomic weight are greater than those from a substance of higher atomic weight, while with the "incidence" kathode rays the substance of high atomic weight gives off more than the substance of lower.

I have been working for some time upon the secondary kathode rays produced by X-rays with a form of apparatus which can be easily adapted for a repetition, with X-rays, of Prof. Bragg's experiments with γ rays (see *Amer. Jour. Sci.*, October, 1907, p. 285). I have therefore tried to

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find out whether his results with γ rays hold also for X-rays.

Following closely Prof. Bragg's method of procedure with pairs of metals consisting of lead and aluminium, copper and aluminium, and copper and lead, I found that in every case the ionisation due to the "emergence" secondary kathode rays was greater than that due to the "incidence" rays. The "incidence" secondary rays were, in different experiments, from 50 per cent. to 90 per cent. of the "emergence." It appeared, however, that the difference was not as large in the case of lead as in the case of copper. This is in agreement with Prof. Bragg's result for γ rays.

A separate experiment showed that the thickness of the layer of copper from which the secondary rays can emerge is not great enough to absorb the primary rays to an extent sufficient to account for the marked difference between the "emergence" and "incidence" secondary rays.

On the other hand, however, both the "emergence" and "incidence" secondary radiation produced greater ionisation when it came from a metal of high atomic weight than when it came from a metal of lower atomic weight. This difference was very marked with the above-mentioned pairs, and also with lead and carbon. This is directly opposite to the effect observed by Prof. Bragg with γ rays.

It should be noticed that the ionisation chambers used in these experiments were so short that a very small fraction of the secondary X-rays coming from the metals was absorbed in them, while they were long enough to absorb all the secondary kathode rays. Thus practically all the ionisation was due to the secondary kathode rays.

Although these experiments, together with those of Prof. Bragg, show that for both X-rays and γ rays the secondary kathode rays are not produced equally in all directions, I cannot agree with Prof. Bragg that the evidence is conclusive that X-rays and γ rays must consist of some type of radiation other than electromagnetic pulses. The reason he gives on the neutral pair theory for lack of symmetry in the secondary rays is that these secondary rays are the negative parts of the primary pairs. As these primary neutral pairs possess momentum in the direction of propagation, it is natural to suppose that their negative parts, when liberated from the positive, would be more likely to continue in their original direction than to turn back.

On the other hand, an electromagnetic pulse possesses momentum also in the direction of propagation. Though little is known of the mechanism of the production of secondary kathode rays by ether pulses, it is not unreasonable to suppose that an ether pulse could contribute some of its momentum to the secondary kathode particles, causing them to go more in the direction of propagation of the primary than in any other.

Since we know that X-rays, which come from a region where electrons are being violently accelerated, must consist in part, at least, of ether pulses, and since all the experimental evidence previously gathered in regard to their nature has been favourable to the ether pulse theory, it seems to me more reasonable to look to the ether pulse theory for an explanation of both X-rays and γ rays than to a theory of neutral pairs. It must, however, be recognised that this lack of symmetry in the secondary kathode rays is a difficulty in the way of the ether pulse theory which needs explanation. I hope soon to determine by means of absorption experiments whether this lack of symmetry is due to a difference in penetrating power or quantity of secondary kathode rays.

Charlton D. Cooksey.

Sheffield Scientific School, Yale University, New Haven, Conn., March 7.

Martinmas in May.

Sir Norman Lockyer in his book on "Stonehenge" connects the festival of St. Martin, which falls on November 11, with the beginning of winter in the May-November year, which falls astronomically on November 9. He does not, however, seem to be aware that there was another festival of St. Martin which fell on May 12. This was the *Subventio St. Martini*, a festival which was appointed to be observed by a council held at Tours in 841 to commemorate the restoration of the relics of the saint to Tours after they had been hidden on account of the incursions of the Northmen. Sir Harris Nicolas in his "Chronology of History," published in 1838, stated that the festival was still observed in the province of Tours. The date of the appointment of the festival is late, but reverence for sacred stones survived until long after that time, and it might be worth while to try to discover whether any connection can be traced between the appointment of the festival and an attempt to discourage the old stone-worship.

It seems clear that it was this festival of the *Subventio* which is alluded to in the entry in the Parker Manuscript of the Old English Chronicle for the year 913:—"In this year about Martinmas King Edward bade build the northern fortress at Hertford, between the rivers Maran, Beane, and Lea: and then after that in the summer between Gang-days and Midsummer King Edward went with part of his forces to Maldon in Essex." The King opened his campaign at Martinmas, May 12, by commencing a fortress at Hertford, and then between Rogationtide (May 23–25) and Midsummer he marched to Maldon. The fact that the chronicler regards the period between May 25 and June 24 as summer has a bearing on the question of the observance of a May-November year. It is likely that the Martinmas of 919 is also the May festival, but it is clear that the Martinmas of 918 and of 921 must be the festival in November.

C. S. Taylor.

Banwell, March 24.

An Annotated Copy of Newton's "Principia."

About three months ago I was asked to look through a list of old books, which had recently come to Australia as portion of the personal property in an estate which had been in Chancery some years. The books had become the property of a resident of this city, who employed an agent to dispose of them.

Among a number of books which I bought was a copy of Newton's "Principia," and when I came to examine it more closely I found that it was one of the original edition of 1687, with the imprimatur of S. Pepys "Reg. Soc. Præses Julii 5 1686." I found also that it contained nearly five pages of MS. additions and corrections for a second edition, written in Latin, as well as numerous corrigenda throughout the book, with occasional detailed alterations in the diagrams.

Inside the cover, in another handwriting, there was the following note:—"The Amendments in this book were written by Sir Isaac's own hand. See his original MSS. of his Optics in Trin. Coll. Library, Cambridge."

I have since compared the handwriting of these "additions and corrections" with a facsimile of Sir Isaac Newton's handwriting in the Commonwealth Parliamentary library, and consider there is a distinct similarity.

I have now had the first two pages of the notes photographed, and have forwarded them to the librarian of the college referred to in the note, with the view of a further comparison.

The notes are punctiliously detailed, with a reference to each page, and the alterations in the body of the text of the book are made with almost microscopic care. As the notes are headed as intended for a second edition, I cannot see what other source but the mind and hand of the author they could have come from.

I am informed by the former owner of the book (Mr. H. C. Elderton) that it belonged to the family of James, of Ightham Court, Kent, probably to Sir Demetrius James, who is supposed to have been knighted about the year 1685. It and a number of other old books formed a small collection which were set apart, packed in oak chests, and stowed away in an old clock-tower, where they remained ever since until brought to Australia.

I shall let you know the result of my inquiries, and, in the meantime, perhaps some of your numerous scientific readers may be able to throw some light on the book's history, for if it should be Sir Isaac Newton's personal copy, and contain his personal notes, it must become an object of great interest to the scientific world.

Bruce Smith.

149 Phillip Street, Sydney, Australia, February 25.

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